Sub A1

1. A rotor assembly configured to rotate within a stator assembly of a rotating machine having a shaft disposed within a non-cryogenic region of the rotor assembly, the rotor assembly comprising:

at least one superconducting winding assembly positioned within a cryogenic region of the rotor assembly, the at least one superconducting winding assembly, in operation, generating a magnetic flux linking the stator assembly; and

a cantilevered member, mechanically coupled between the at least one superconducting winding assembly and the shaft, the cantilevered member extending between the non-cryogenic region and cryogenic region of the rotor assembly.

2. The rotor assembly of claim 1 wherein the cantilevered member is positioned between the superconducting winding and the shaft.

3. The rotor assembly of claim 2 wherein the cantilevered member is positioned in a radial space between the superconducting winding and the shaft.

4. The rotor assembly of claim 1 the cantilevered member extends along a longitudinal axis of rotor assembly.

5. The rotor assembly of claim 1 wherein the cantilevered member has a length sufficient for providing substantial thermal isolation between the at least one superconducting winding and the shaft.

6. The rotor assembly of claim 5 further comprising a support member for supporting the at least one superconducting winding assembly.

7. The rotor assembly of claim 6 wherein the cantilevered member and support member are formed of the same material.

8. The rotor assembly of claim 7wherein the cantilevered member is metal.

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9. The rotor assembly of claim 7wherein the metal comprises Inconel.

10. The rotor assembly of claim 7 wherein the material comprises a composite material.

11. The rotor assembly of claim 1 further comprising a high permeability member positioned within the internal volume and between the shaft and the at least one superconducting winding.

12. The rotor assembly of claim 6 further comprising a high permeability member positioned between the shaft and the support member.

13. The rotor assembly of claim 1 further comprising a plurality of spokes, each spoke mechanically radially fixing the cantilevered member to the shaft.

14. The rotor assembly of claim 1 wherein the cantilevered member includes a bumper adapted to contact the shaft when the rotor assembly is subjected to transverse shock

15. The rotor assembly of claim 1 wherein the cantilevered member is mechanically coupled to the support member with a weld joint.

16. The rotor assembly of claim 1 wherein the at least one superconducting winding assembly comprises a high temperature superconductor.

17. The rotor assembly of claim 1 wherein the cantilevered member is formed of a material having an elongation characteristic of at least 10%.

18. The rotor assembly of claim 1 wherein the cantilevered member is formed of a material having a yield strength characteristic of at least 50 ksi.

19. The rotor assembly of claim 1 wherein the cantilevered member is formed of a material having a stiffness ratio less than 20 nanoW*M/N.

20. The rotor assembly of claim 1 wherein the cantilevered member is formed of a material having a strength ratio less than 5 microW*M/N.

21. The rotor assembly of claim 1 is configured to rotate at speeds of less than 900 rpm.

22. The rotor assembly of claim 1 has a 25 Mwatt rating.

23. The rotor assembly of claim 22 wherein the cantilevered member has a length in a range between 1200 and 1600 mm.

24. The rotor assembly of claim 22 wherein the cantilevered member has a length of approximately 1390 mm.

25. A rotating machine comprising:

a shaft disposed within a non-cryogenic region of the rotating machine;

a stator assembly;

a rotor assembly surrounded by the stator assembly and including:

at least one superconducting winding assembly positioned within a cryogenic region of the rotor assembly, the at least one superconducting winding assembly, in operation, generating a magnetic flux linking the stator assembly; and

a cantilevered member, mechanically coupled between the at least one superconducting winding assembly and the shaft, the cantilevered member extending between the non-cryogenic region and cryogenic region of the rotor assembly.

26. The rotating machine of claim 25 wherein the cantilevered member is positioned between the at least one superconducting winding and the shaft.

27. The rotating machine of claim 25wherein the cantilevered member extends along a longitudinal axis of rotor assembly.

28. The rotating machine of claim 25 wherein the cantilevered member has a length sufficient for providing substantial thermal isolation between the at least one superconducting winding and the shaft.

29. The rotating machine of claim 28 further comprising a support member for supporting the at least one superconducting winding assembly.

30. The rotating machine of claim 29 wherein the cantilevered member is metal.

sub a4 > 31. The rotating machine of claim 29 wherein the metal comprises Inconel.

32. The rotating machine of claim 25 further comprising a high permeability member positioned within the internal volume and between the shaft and the at least one superconducting winding.

33. The rotating machine of claim 29 further comprising a high permeability member positioned within the internal volume and between the shaft and support member.

34. The rotating machine of claim 25 wherein the rotor assembly is configured to rotate at speeds of less than 900 rpm.

35. The rotating machine of claim 25 wherein the rotating machine has a power characteristic of greater than 2 Mwatts.

sub a5 36. A rotor assembly configured to rotate within a stator assembly of a rotating machine having a shaft disposed within a non-cryogenic region of the rotor assembly, the rotor assembly comprising:

at least one superconducting winding assembly positioned within a cryogenic region of the rotor assembly, the at least one superconducting winding assembly, in operation, generating a magnetic flux linking the stator assembly; and

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means, mechanically coupled between the at least one superconducting winding assembly and the shaft, for transmitting torque to the shaft, the means for transmitting torque extending between the non-cryogenic region and cryogenic region of the rotor assembly, the means for transmitting torque to the shaft including a cantilevered member.